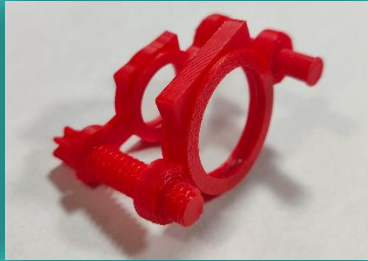


PROTOTYPE DEVELOPMENT

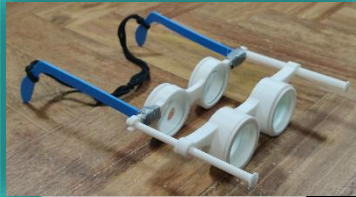
Focusing System Initial Prototype

An initial proof of concept lens system utilizing a diverging lens and a converging lens



Focusing System Version 2

Wearable adjustable lenses utilizing a -50 mm focal length diverging lens and a 100 mm focal length converging lens.



Full Prototype Final Version

Fully assembled system with all features implemented.



MEET THE TEAM



need.

Julie Gallagher is currently a senior at the University of Central Florida. Aiming to expand her expertise and knowledge in the field, while utilizing engineering skills and tools developed over the years to drive innovative solutions. Driven by a strong desire to address challenges and provide solutions for those in



Genaro Morales Jr is currently a senior at the University of Central Florida. He will be graduating from the University of Central Florida with a Bachelor's of Photonic Science and Engineering in May of 2025. He is currently working as a Research Assistant in the Microstructured Fibers and Devices research group under Dr. Rodrigo Amezcua Correa. After graduation, he plans on working at Relativity Networks as a Photonic Component Engineer.



Midkhat Satdanov is currently a senior at the University of Central Florida. He is hoping to pursue biomedical photonics and engage in bettering the lives of others through engineering.



Kayla Stanley is currently a senior at the University of Central Florida. She will be graduating with a degree in Computer Engineering and is planning on pursuing additional education to pursue a career working with the research, development, and maintenance of medical devices.

AUTO-FOCUSING AND COLOR IDENTIFYING LENSES FOR MILD VISUAL IMPAIRMENTS (P.A.U.L.)



JULIE GALLAGHER
GENARO MORALES JR
MIDKHAT SATDANOV
KAYLA STANLEY

Why?

Around the world, billions of people face vision-related challenges that reduce their quality of life. While there are phone apps that offer assistance to the visually impaired, they often rely on volunteers. People with conditions such as presbyopia struggle to focus on nearby objects due to weakened eye muscles, while those with color vision deficiencies face difficulty distinguishing certain colors.

Our Idea

We aim to develop assistive lenses that enhance vision and promote independence for the visually impaired. Our prototype focuses on two key features: auto-focusing and color identification

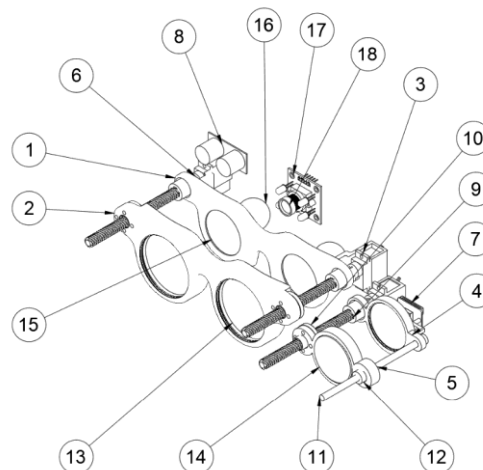
FEATURES

AUTO-FOCUS

To help individuals with visual conditions such as nearsightedness and farsightedness, our system features artificial accommodation capable of providing between -2.5 diopters of optical power and +3.5 diopters of optical power. This is achieved utilizing a two-lens system mounted on a motorized rail which is guided by a time-of-flight sensor and a CMOS sensor. A Sobel filter based algorithm analyzes the images captured by the CMOS sensor to identify when an image is in focus and informs the user through audio feedback.

COLOR IDENTIFICATION

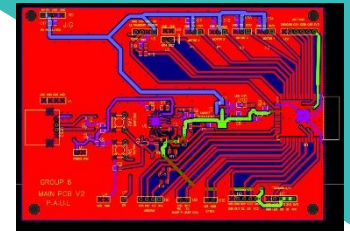
For users with color vision deficiencies, our system offers real-time color recognition achieved through the use of a colorimeter and a CMOS sensor. Once a color is identified, the user is informed through audio feedback.



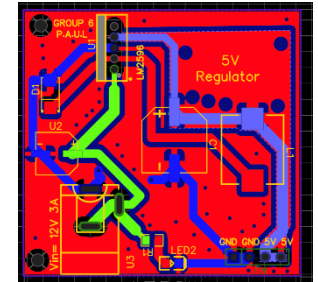
Optical Diagram Components list		
Item #	Qty	Component
1	1	Primary Frame A
2	1	Primary Frame B
3	3	MG90S Micro Servo
4	1	CMOS Frame A
5	1	CMOS Frame B
6	3	Tr8x8 Coupler
7	1	Pi Camera Module 2
8	1	HC-SR04 Ultrasonic Sensor
9	3	Tr8x8 Screw
10	3	Tr8x8 Nut
11	1	5mm Rod
12	1	Linear Bearing
13	2	Biconcave Lens -50 mm FL / 50 mm Dia.
14	1	Biconcave Lens -50 mm FL / 38 mm Dia.
15	3	Biconvex Lens 100 mm FL / 38 mm Dia.
16	2	Eyes
17	1	TCS3200 Color Sensor
18	1	4x Telephoto Lens

PCB LAYOUTS

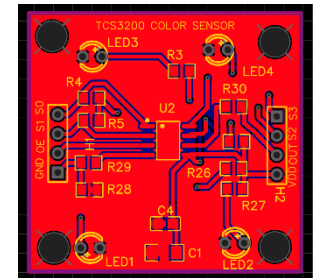
Main PCB
ESP32
AMS1117
3.3V Regulator



5V Regulator
LM2596



Color Detector Board
TCS 3200



EDGE-DETECTION

A Sobel filter calculates the gradient magnitude of the image by applying convolution operations in both the horizontal and vertical directions. The darker the box, the more the contrast. The contrast is then assigned a value which is compared to a threshold value to determine focus.

